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the submerged algal flora of tropical freshwaters the Cyanophyceae also constitute a very important element, though not as preponderant as in the subaerial flora. This freshwater flora is composed of forms in which narrow filaments are much more abundant than broad ones, a fact thought to be related to the small amount of dissolved oxygen in the water. *Cladophora* and *Rhizoclonium* are very poorly represented, and *Vaucheria* and *Botrydium* are very rare. The Confervales are not very well represented, and probably the Ulotrichales do not attain much development. *Spirogyra*, on the other hand, is even more abundant in the tropics than in northern latitudes. The desmids show a marked filamentous tendency, which may be due to poor aeration. *Oedogonium* is very abundant, and the freshwater red algae are not at all uncommon.—J. M. C.

Gametophytes and embryo of *Libocedrus*.—LAWSON²¹ has added *Libocedrus* to the investigated Cupressineae and shows that it agrees in all essential characters with the other genera of the group, as may be seen from the following outline of the results. No prothallial cells are formed in the pollen grain, which at shedding contains the generative and tube nuclei. The pollen tube advances very directly to the archegonial chamber, and upon its arrival the body cell divides to form two large and equal male cells. One to three megaspore mother cells occur and each gives rise to a tetrad. The functioning megaspore becomes filled with endosperm tissue in the usual way, and the megaspore membrane is poorly developed. The archegonia range in number from six to twenty-four, and are grouped in a single complex, invested by a single layer of jacket cells. The ventral canal cell, as in other Cupressineae, is represented only by its nucleus. The contents of the pollen tubes are discharged into the common archegonial chamber, so that both male cells in a tube may function. In fertilization the male slips from its cytoplasmic sheath and unites with the egg nucleus. The two nuclei arising from the division of the fusion nucleus pass to the bottom of the egg and by two successive divisions form eight free nuclei before wall-formation. The cells of the proembryo are arranged in the usual three tiers.—J. M. C.

Evolution of the vascular system of ferns.—TANSLEY²² has begun the publication of a series of lectures on the evolution of the vascular system of the Filicineae, the first considering the origin of the pteridophytes. The lecturer commits himself to the following positions: that bryophytes and pteridophytes have arisen from the algae independently; that the alternation of generations of the former is "antithetic," of the latter "homologous;" that the prevailing habit of dichotomy among the Filicineae indicates ancestors of the dichotomously branching thallus type, in which the "sporangiferous thallus became specialized for assimilatory functions;" that from such forms the "Filicales, Sphenophyllales, and Equis-

²¹ LAWSON, ANSTRUTHER A., The gametophytes and embryo of the Cupressineae with special reference to *Libocedrus decurrens*. *Annals of Botany* 21:281-301. pls. 24-26. 1907.

²² TANSLEY, A. G., Lectures on the evolution of the filicinean vascular system. I. *New Phytol.* 6:25-35. 1907.

tales originated, the first group retaining the characters of the primitive type;" and that the Lycopodiales "may perhaps be regarded as an extreme case of leaf reduction in one of these lines."—J. M. C.

Apogamy in Hieracium.—ROSENBERG²³ finds that in *Hieracium auricula* and *H. venosum* the development of pollen and embryo sacs is normal and fertilization occurs regularly; there are 9 chromosomes in the gametophyte, 18 in the sporophyte, and 27 in the endosperm. Most species of *Hieracium*, however, are apogamous, and their embryo sacs are formed without any reduction division. Usually they do not arise from megaspores, but from cells of the integument or chalaza; that is, the gametophyte is aposporous and contains the sporophytic number of chromosomes. In *H. excellens* an embryo sac with the reduced number of chromosomes is often formed, but there are usually aposporous sacs in the same head. This shows why *H. excellens*, in spite of its being apogamous, may also produce hybrids.—CHARLES J. CHAMBERLAIN.

Geographic distribution of closely related species.—LEAVITT²⁴ has published a study of the distribution of species in reference to their evolution. The topics discussed are "the effects of different evolutionary agencies upon specific distribution," "the necessity of isolation and Mendelian inheritance," "specific distribution in the animal kingdom," "the distribution of plants," and "evidence from North American Orchidaceae." The problems are stated and solutions are not attempted, but the impression of the author is that a study of the specific distribution of plants is not likely to be unfavorable to mutation as one method of evolution. He thinks that "the adherents of mutation will be able to bring forward enough cases of social distribution to render phytogeographic weapons useless in the attack upon this theory."—J. M. C.

Cytology of apospory.—*Nephrodium pseudo-mas* Rich. var. *cristata apospora* Drury, according to Miss DIGBY,²⁵ shows almost all grades of apospory and apogamy except parthenogenesis. Several fronds pegged down quickly produced prothallia at the tips of the leaves, and these prothallia within three weeks bear apogamous embryos. Antheridia are not uncommon, but no archegonia could be found. The number of chromosomes in cells of the leaf, aposporous prothallia, and in the apogamous embryos is about 50, there being no reduction of chromosomes. In *N. pseudo-mas* Rich. var. *polydactyla* Wills, migrating nuclei, some of which have been seen to fuse, are a characteristic feature; while in the var. *cristata apospora* Drury there seems to be no migration or fusion of nuclei.—CHARLES J. CHAMBERLAIN.

²³ ROSENBERG, O., Cytological studies on the apogamy in *Hieracium*. Bot. Tidsskrift **28**:143-170. pls. 1-2. 1907.

²⁴ LEAVITT, ROBERT GREENLEAF, The geographic distribution of closely related species. Amer. Nat. **41**:207-240. 1907.

²⁵ DIGBY, L., On the cytology of apogamy and apospory. II. Preliminary note on apospory. Proc. Roy. Soc. London **76**:463-467. 1905.